FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Big Blackfoot Chapter of Trout Unlimited-Ryen Neudecker

Mailing Address: PO Box 1

City: Ovando State: MT Zip: 59854

Telephone: 406-240-4824 E-mail: ryen@montanatu.org

B. Contact Person (if different than applicant): See above

Address:

City: State: Zip:

Telephone: E-mail:

C. Landowner and/or Lessee Name (if different than applicant): Perk Perkins

Mailing Address: PO Box 2116

City: Jackson State: WY Zip: 83001

Telephone: (802) 345-6695 E-mail: perkinsp@orvis.com

II. PROJECT INFORMATION

A. Project Name: Poorman Creek Restoration-Phase 2

River, stream, or lake: Poorman Creek

Location: Township: 14N Range: 9W Section: 25, 36

Latitude: 46.561230 Longitude: -112.404893 *within project (decimal degrees)*

County: Lewis & Clark

B. Purpose of Project:

The purpose of this project is to restore a high-priority, native trout tributary in the upper Blackfoot River by restoring channel stability, riparian health and aquatic habitat function to improve overall recruitment to the Blackfoot River.

C. Brief Project Description (attach additional information to end of application):

Poorman Creek is a third order tributary to the upper Blackfoot River and flows 14 miles through a mix of USFS and private land. The stream supports populations of pure westslope cutthroat trout and bull trout, a species of special concern and a threatened species under the federal endangered species act. Poorman Creek is a high priority tributary as ranked in "An Integrated Stream Restoration and Native Fish Conservation Strategy for 182 streams in the Blackfoot Basin" and is listed as critical bull trout habitat. Poorman Creek has been the focus of several past projects funded through the Future Fisheries program, including fish passage, fish screening, stream restoration, and water conservation. We now have the opportunity to switch our focus to a two-mile reach of Poorman Creek near its confluence with the Blackfoot River. From the headwaters to the mouth of the upper Blackfoot River, Poorman Creek has been identified as an impaired waterbody by MTDEQ and is listed for the following impairments: alteration of streamside vegetation, metals, flow regime modifications, and sediment. In the project reach, historical watershed and land use disturbances continue to affect the quality of aquatic and riparian habitat conditions. The stream suffers from entrenchment, lack of instream and riparian habitat, channel aggradation reducing channel capacity, and bank erosion. BEHI data collection has indicated that an estimated 409 tons per year of sediment is contributed to Poorman Creek from streambank related sources, primarily related to bank erosion and channel instability.

This project will restore a degraded reach of Poorman Creek and ensure connectivity with a functioning floodplain following natural channel design principles. Approximately 8,400 feet of channel will be restored through a variety of treatments including channel reconstruction or shaping, creating instream habitat through the creation of step pools, incorporating vegetated wood matrix and large woody debris structures. A grazing management plan has been completed covering 550 acres and the riparian area will be excluded from grazing for a minimum of 10 years to ensure the riparian area has recovered. The landowner has also committed to a water lease ensuring minimum instream flows are available for a healthy trout fishery through the project reach.

Specific objectives include: reestablish floodplain connectivity and function; improve existing instream and riparian habitat for native trout by emulating reference reach conditions; correct chronic bank erosion issues and restore a self-maintaining stream system based on natural channel design principles and standards.

D. Length of stream or size of lake that will be treated (project extent): 8,400 feet

Length/size of impact, if larger than project extent (e.g. stream miles opened): _____

E. Project Budget:

Grant Request (Dollars):	**$**	**58,000.00**
Matching Dollars:	**$**	**277,927.00**
Matching In-Kind Services:*	**$**	**66,052.40**
		salaries of government employees are not considered matching contributions
Total Project Cost:	**$**	**401,979.40**

F. **Attach** itemized (line item) budget – *see budget template*

G. **Attach** specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire* (fwp.mt.gov/habitat/futurefisheries/supplement2.doc).

H. **Attach** land management & maintenance plans that will ensure protection of the reclaimed area.

III. PROJECT BENEFITS (attach additional information to end of application):

A. What species of fish will benefit from this project?

Bull trout,westslope cutthroat trout, and brown trout.

B. How will the project protect or enhance wild fish habitat?

Wildtrout populations in the Blackfoot River require cold, clean, complex and connected habitat. This project will improve instream habitat by reducing sedimentation, increasing pool complexity and promoting a self-maintaining channel that will function hydrologically and be connected to a floodplain with a healthy riparian area. This section of stream is in a hydrologic losing reach, so increasing pool frequency will provide trout with additional refugia during baseflow.

C. Will the project improve fish populations and/or fishing? To what extent?

Yes, by providing off-site recruitment to the Blackfoot River. Poorman Creek enters a portion of the Blackfoot River that receives high angling pressure and has multiple access points for public use.

D. Will the project increase public fishing opportunity for wild fish and, if so, how?

Yes, by increasing wild trout habitat in the Blackfoot River drainage. This project will increase trout recruitment to the Blackfoot River by improving spawning and rearing habitat in a high priority tributary. The project will increase habitat capacity, and therefore, trout abundance in Poorman Creek, which provides public fishing opportunities via the stream access law at bridges in the lower reaches and Forest Service land in the upper reaches.

E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

The landowner has committed to signing a Landowner Agreement for a minimum of 20 years.

F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?

Historical channelization has led to downcutting and lack of floodplain connection. In other reaches, aggradation has occurred from dewatering and channel blockages and has created channel braiding.

G. What public benefits will be realized from this project?

This project involves the continuation of the Blackfoot River Restoration program and the restoration of a native westslope cutthroat and bull trout stream. Public benefits include: 1) expanding suitable habitat conditions for pure fluvial westslope cutthroat trout and fluvial bull trout populations, 2) improved water quality (temperature) on-site and downstream, and 3) contribute to the recovery of westslope cutthroat trout. Additionally, the Bull Trout Conservation Strategy lists the Poorman drainage as an important population that contributes to Blackfoot core bull trout population; the strategy identifies the main factor limiting recovery of bull trout as the lack of high-quality tributaries throughout the watershed. This project, in conjunction with the cumulative effects of other projects in the drainage, will benefit bull trout and work towards stability and recovery of the core population, which is in the public's interest. Overall, this project is expected to increase trout abundance, which will enhance the public's opportunity to enjoy quality angling experiences in the upper Blackfoot River watershed.

H. Will the project interfere with water or property rights of adjacent landowners? (explain):

No. This project will have no effect on water and property rights of adjacent landowners.

I. Will the project result in the development of commercial recreational use on the site? (explain):

No commercial recreational use is known to legally occur at this site.

J. Is this project associated with the reclamation of past mining activity?

No, the project isn't associated with past mining activities.

Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.

IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature: Ryer Neudecker Date: 5/25/2020

Sponsor (if applicable): _____

Submittal: **Applications must be *signed and received before* December 1 and June 1 of each year to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	Montana FWP Fish Management Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Michelle McGree mmcgree@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov

Applications may be rejected if this form is modified.

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	CONTRIBUTIONS			
					FUTURE FISHERIES REQUEST	IN-KIND SERVICES**	IN-KIND CASH	TOTAL
Personnel* **								
Survey	60	hrs	$100.00	$ 6,000.00			6,000.00	$ 6,000.00
Design	120	hrs	$110.00	$ 13,200.00			13,200.00	$ 13,200.00
Engineering	50	hrs	$100.00	$ 5,000.00			5,000.00	$ 5,000.00
Permitting	45	hrs	$45.00	$ 2,025.00		2,025.00		$ 2,025.00
Oversight	250	hrs	$105.00	$ 26,250.00			26,250.00	$ 26,250.00
Oversight	190	hrs	$45.00	$ 8,550.00		8,550.00		$ 8,550.00
			Sub-Total	$ 61,025.00	$ -	$ 10,575.00	$ 50,450.00	$ 61,025.00
Travel								
Mileage	5280	miles	$0.58	$ 3,062.40		3,062.40		$ 3,062.40
			Sub-Total	$ 3,062.40	$ -	$ 3,062.40	$ -	$ 3,062.40
Construction Materials** **								
Transplants	99	each	$25.00	$ 2,475.00		2,475.00		$ 2,475.00
Willow Cuttings	13,500	each	$1.00	$ 13,500.00	4,000.00	4,000.00	5,500.00	$ 13,500.00
Fence	8708	ft	$1.50	$ 13,062.00			13,062.00	$ 13,062.00
Stock tanks	2	each	$800.00	$ 1,600.00			1,600.00	$ 1,600.00
Pipeline	5800	ft	$1.80	$ 10,440.00			10,440.00	$ 10,440.00
Brush	60	CY	$100.00	$ 6,000.00		1,500.00	4,500.00	$ 6,000.00
Wood	100	CY	$250.00	$ 25,000.00		12,500.00	12,500.00	$ 25,000.00
Gravel	1208	CY	$5.00	$ 6,040.00		6,040.00		$ 6,040.00
Sod	74,000	SQ FT	$0.35	$ 25,900.00		25,900.00		$ 25,900.00
			Sub-Total	$ 104,017.00	$ 4,000.00	$ 52,415.00	$ 47,602.00	$ 104,017.00
Equipment and Labor								
Hydraulic Excavator	425	hrs	$168.00	$ 71,400.00	22,000.00		49,400.00	$ 71,400.00
Hydraulic Excavator	415	hrs	$165.00	$ 68,475.00	20,000.00		48,475.00	$ 68,475.00
Tracked Skidsteer	200	hrs	$95.00	$ 19,000.00	5,000.00		14,000.00	$ 19,000.00
Off Road Truck	300	hrs	$170.00	$ 51,000.00	5,000.00		46,000.00	$ 51,000.00
Labor	200	hrs	$45.00	$ 9,000.00	2,000.00		7,000.00	$ 9,000.00
			Sub-Total	$ 218,875.00	$ 54,000.00	$ -	$ 164,875.00	$ 218,875.00
Mobilization								
All Equipment	1	lump Sum	$15,000.00	$ 15,000.00			15,000.00	$ 15,000.00
			Sub-Total	$ 15,000.00	$ -	$ -	$ 15,000.00	$ 15,000.00
			TOTALS	$ 401,979.40	$ 58,000.00	$ 66,052.40	$ 277,927.00	$ 401,979.40

(Revised 5/29/2020)

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

****Design and oversight consultant was seleted through a competitive Request for Proposals process**

MATCHING CONTRIBUTIONS (do not include requested funds)

CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
Landowner	$ 52,415.00	$ 18,000.00	$ 70,415.00	Yes
WestSlope TU Chapter	$ -	$ 10,000.00	$ 10,000.00	No
USFWS Partners Program	$ -	$ 15,000.00	$ 15,000.00	Yes
DEQ 319 Program	$ -	$ 24,000.00	$ 24,000.00	Yes
NFWF	$ -	$ 32,000.00	$ 32,000.00	No
DEQ 319 Program	$ -	$ 135,000.00	$ 135,000.00	No
Big Blackfoot Chapter of Trout Unlimited	$ 13,637.40	$ 43,927.00	$ 57,564.40	Yes
TOTALS	$ 66,052.40	$ 277,927.00	$ 343,979.40	

EXISTING CONDITIONS ON POORMAN CREEK PHASE TWO

May 28, 2020

Dear Members of the Future Fisheries Review Panel:

My family members and I are owners of a small ranch in Lincoln Montana through which Poorman Creek flows. We acquired the first parcel in 1990 and were able to acquire an adjoining parcel from the same landowner a couple years ago. Between the two parcels, there is about two miles of Poorman Creek.

Our values and priorities for this ranch focus on improvement and development of its fish and wildlife habitat. We are proud of the progress we have made with the expertise and help from Mt FWP, BBCTU, the Clark Fork Coalition and the Blackfoot Challenge.

We have been advised by the above entities that Poorman Creek is a diamond in the rough; that it is an important spawning tributary for West Slope Cutthroat and Bull Trout and that it has more potential than we had realized. Inspired by this input, we have embarked on a long-range plan to improve the riparian habitat. The first major part was to permanently protect the stream's flow from being dewatered by irrigations withdrawals. Second phase was to improve the fencing and water supply for our grazing program so cattle would not damage the creek's banks. This included an ongoing major weed management program. The next phase involves restoration of the creeks channel. We are fortunate to be receiving guidance from Ryen Neudecker of BBCTU for this next phase.

The purpose of this email is to advise the members of the history and long-term devotion to the care of the land for its fish and wildlife potential. I understand that BBCTU is applying for a grant to help with the implementation of the restoration of Poorman Creek through our ranch and we hope that you will look favorably upon that appeal for your support. We are most appreciative of every bit of support we get and hope we are viewed as deserving landowners and cooperative partners.

Sincerely,
Perk Perkins
Managing Partner, PARCS 2.0 LLC (Family Partnership)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
MONTANA PARTNERS FOR FISH & WILDLIFE PROGRAM
PO Box 66
Ovando, Montana 59854 406/793.7400

IN REPLY REFER TO:

May 28, 2020

Montana Future Fisheries Committee
1420 E 6th Ave
Helena, MT 59620

Dear Committee Members:

This letter is in reference to the Poorman Creek Restoration Project located in the Blackfoot Watershed being proposed by the Big Blackfoot Chapter of Trout Unlimited. The U.S. Fish and Wildlife Service fully support this project because of the incredible biological values associated with it.

The Partners for Fish and Wildlife has a long history of working with the associated private landowners and other partners collaborating to restore the native trout fishery of this important tributary to the Blackfoot River. This project is exciting in that we will be able to continue our efforts of restoring native trout within the watershed by working with committed landowners.

We commend the efforts of the many partners for their time and due diligence with this important project and urge the Future Fisheries Review Panel to support this grant application.

If you have any questions regarding this project feel free to contact me.

Sincerely,

Greg Neudecker
State Coordinator
Partners for Fish and Wildlife Service

FWP.MT.GOV

THE **OUTSIDE** IS IN US ALL.

Patrick Uthe
3201 Spurgin Road
Missoula, MT 59804
406-542-5532
patrick.uthe@mt.gov

May 27, 2020

Montana Fish, Wildlife and Parks
Attn: Michelle McGree
1420 East 6th Ave.
Helena, MT 59620

Dear Future Fisheries Panel:

I am writing to express support for the Big Blackfoot Chapter of Trout Unlimited's Poorman Creek Restoration – Phase 2 project. Poorman Creek has significant native species and sport fishery values. It is ranked as a high priority within the Blackfoot River prioritization framework because of its biological value and potential to improve flows and water quality in the Blackfoot River. The proposed project is in the lower section where current limiting factors include poor riparian and streambank conditions from livestock grazing, lack of instream habitat complexity, and low discharge from irrigation impacts. A recent instream flow conservation project restored flow through this section to the confluence with the Blackfoot River. Therefore, restoring habitat quality through the Phase 2 project will enhance the benefits of the instream flow lease.

The Poorman Creek/Grantier Spring Creek system provides important overwinter and summer refugia for trout that migrate from the intermittent reach of the Blackfoot River near Lincoln. Brown Trout and Westslope Cutthroat Trout are the primary species inhabiting this section, but Bull Trout migrate to and from spawning areas in upper Poorman Creek. The improved habitat complexity and increased pool frequency will provide ideal habitat for trout inhabiting and migrating through this section. Moreover, of all the smaller Bull Trout populations in the Blackfoot that have experienced declines, Poorman Creek has the greatest potential to experience a recovery from restoration actions.

I expect this project to directly benefit the fishery through improved spawning conditions for Westslope Cutthroat Trout and Brown Trout, and improved rearing and foraging opportunities for all trout species. Implementation of the Phase 2 project will increase recruitment of trout to the Blackfoot River and increase trout abundance and enhance fishing opportunities within Poorman Creek. Thank you very much for consideration of this funding request. Please do not hesitate to contact me if you have any questions or would like additional fisheries information from the project area.

Sincerely,

Patrick Uthe
Fisheries Biologist

POORMAN CREEK RESTORATION PROJECT
CONCEPTUAL DESIGN PLANSET

PROJECT PARTNERS

BIG BLACKFOOT CHAPTER OF
TROUT UNLIMITED
PO BOX 1
OVANDO, MONTANA 59854

US FISH AND WILDLIFE SERVICE
PO BOX 66
196 LOWER LAKE SIDE LANE
OVANDO, MONTANA 59854

PROJECT DESCRIPTION

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED (BBCTU), IN COOPERATION WITH THE U.S. FISH AND WILDLIFE SERVICE AND PRIVATE LANDOWNERS, RETAINED RIVER DESIGN GROUP, INC. TO DEVELOP RESTORATION PLANS FOR A TWO MILE REACH OF POORMAN CREEK, A TRIBUTARY TO THE BLACKFOOT RIVER LOCATED SOUTH OF LINCOLN IN LEWIS AND CLARK COUNTY, MONTANA. POORMAN CREEK IS A THIRD ORDER TRIBUTARY TO THE UPPER BLACKFOOT RIVER AND SUPPORTS POPULATIONS OF NATIVE BULL TROUT, A THREATENED SPECIES UNDER THE FEDERAL ENDANGERED SPECIES ACT, AND NATIVE WESTSLOPE CUTTHROAT TROUT, A MONTANA SPECIES OF SPECIAL CONCERN. HISTORICAL LAND USE DISTURBANCES INCLUDING CHANNELIZATION, DEWATERING, GRAZING, RIPARIAN VEGETATION REMOVAL AND CONVERSION, AND UNDERSIZED BRIDGES, HAVE RESULTED IN DEGRADED AQUATIC HABITAT CONDITIONS AND ALTERED STREAM CHANNEL FORM AND FUNCTION.

FROM THE HEADWATERS TO THE MOUTH OF THE UPPER BLACKFOOT RIVER, POORMAN CREEK HAS BEEN IDENTIFIED AS AN IMPAIRED WATERBODY BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (MDEQ, 2018). THE STREAM IS CLASSIFIED A B-1 WATERBODY, AND IS CONSIDERED NON-SUPPORTING OF AQUATIC LIFE. REPORTED CAUSES OF WATER QUALITY IMPAIRMENT INCLUDE: 1) ALTERATION IN STREAMSIDE VEGETATION; 2) COPPER, CADMIUM AND LEAD; 3) FLOW REGIME MODIFICATIONS; AND 4) SEDIMENTATION/SILTATION. PROBABLE POLLUTANT SOURCES INCLUDE FOREST ROADS, IMPACTS FROM ABANDONED MINES, SILVICULTURAL ACTIVITIES, WATER DIVERSION, AND NATURAL SOURCES.

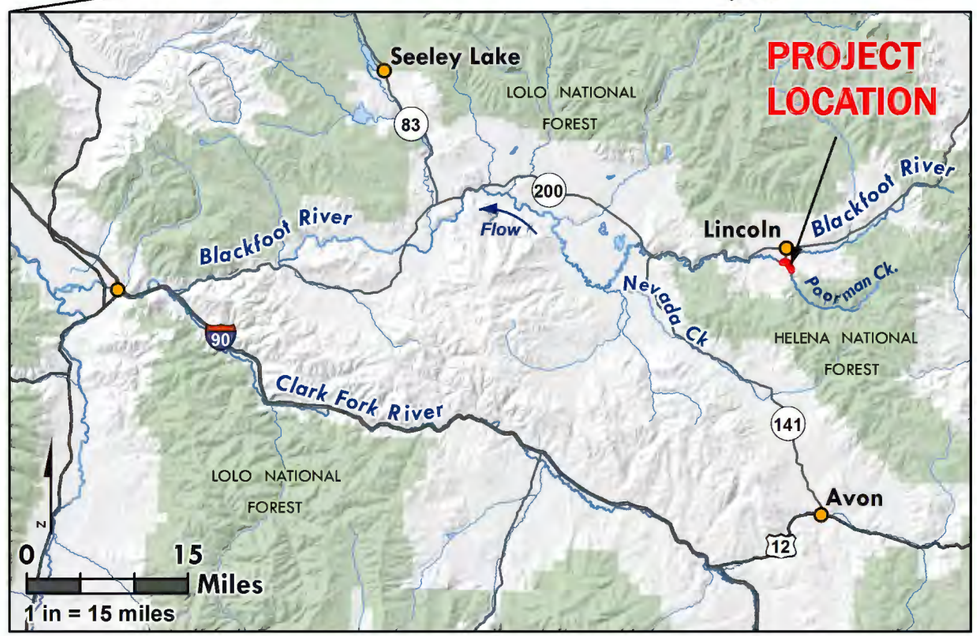
HISTORICAL WATERSHED AND LAND USE DISTURBANCES CONTINUE TO AFFECT THE QUALITY OF AQUATIC AND RIPARIAN HABITAT CONDITIONS IN LOWER POORMAN CREEK. AN ESTIMATED 409 TONS PER YEAR OF SEDIMENT IS CONTRIBUTED TO POORMAN CREEK FROM STREAMBANK RELATED SOURCES, PRIMARILY RELATED TO BANK EROSION AND CHANNEL INSTABILITY. TO ADDRESS THESE LIMITING FACTORS, RESTORATION PROJECT OBJECTIVES INCLUDE RESTORING STREAMBANK AND RIPARIAN CONDITIONS, ESTABLISHING PROPER STREAM CHANNEL DIMENSIONS AND CHANNEL CAPACITY, INCREASING THE QUALITY AND DISTRIBUTION OF COMPLEX AQUATIC HABITAT FEATURES INCLUDING RIFFLES AND POOLS, AND INCREASING FLOODPLAIN CONNECTIVITY AND VEGETATION DIVERSITY.

THESE DRAWINGS REPRESENT A 50% PRELIMINARY DESIGN AND WILL BE FINALIZED BASED ON INPUT FROM PROJECT STAKEHOLDERS.

DRAWING INDEX

POORMAN CREEK VICINITY MAP

LOCATED IN NW$^1/_4$ S36, T14N, R9W; AND S$^1/_2$ S25, T14N, R9W.



REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA/GD
3	11.22.19	REVISION	SA/GD

COVER PAGE

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | 311 SW JEFFERSON AVE
WHITEFISH, MT 59937 | CORVALLIS, OR 97333
406.862.4927 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER 1.0

CHANNEL BLOCKAGE

UPSTREAM PANEL

DOWNSTREAM PANEL

40+00

30+00

AGGRADATION WITH MULTIPLE CHANNELS

BRIDGE 1

20+00

BERM

BERM

FORD

ABANDONED DITCH

FORD

ABANDONED DITCH AND HEADCUT

10+00

0+00

REACH START

FLOW DIRECTION

LOSING WATER DUE TO MULTIPLE CHANNEL BLOCKAGES

POORMAN CREEK IS CURRENTLY A B4C TYPE STREAM IN THE UPPER 1,400 FEET OF THE PROJECT DUE TO HISTORICAL CHANNELIZATION AND DOWNCUTTING, AND WAS LIKELY A "C" TYPE STREAM HISTORICALLY. THIS REACH IS MODERATELY ENTRENCHED INTO THE VALLEY BOTTOM (SEE SHEET 2.2), RELATIVELY STRAIGHT, AND EXHIBITS PRIMARILY RIFFLE MORPHOLOGY. SEVERAL ABANDONED DIVERSIONS ALONG WITH BERMS ALONG THE CHANNEL INDICATE THAT THIS REACH WAS ALTERED TO ACCOMMODATE AGRICULTURAL DIVERSIONS, WHICH HAVE SINCE BEEN CONVERTED TO PIVOTS AND WELLS. ABANDONED EQUIPMENT LIES ADJACENT TO THE STREAM, BANK EROSION IS PREVALENT, AND HEADCUTS ASSOCIATED WITH PAST DIVERSIONS AND BERMS ARE PRESENT. VEGETATION IS DOMINATED BY CONIFERS AND JUNIPER, INDICATIVE OF UPLAND CONDITIONS.

FROM STATION 14+00 DOWNSTREAM, THE STREAM IS LESS ENTRENCHED AND MEANDERS INTO A C4 TYPE STREAM. GRADIENT IS REDUCED TO APPROXIMATELY 0.7 % AND POOLS ARE FREQUENT. AN UNDERSIZED BRIDGE AT STATION 22+00 CAUSES SCOUR THROUGH THE BRIDGE AND BACKWATER UPSTREAM. SEVERE AGGRADATION DOWNSTREAM FROM THE BRIDGE HAS RESULTED IN LOSS OF CHANNEL CAPACITY, AND BRAIDING OCCURS DOWNSTREAM TO STATION 27+00. COTTONWOOD AND ALDER COMMUNITIES ARE PRESENT BUT ARE RESTRICTED TO A NARROWER BAND ALONG THE CREEK THAN WOULD BE EXPECTED WITH THE STREAM MORPHOLOGY.

DOWNSTREAM PANEL

CONFLUENCE WITH SPRING CREEK

SCOURED FORD

80+00

70+00

BRIDGE 2

60+00

CHANNEL CONSTRICTED BY VEGETATION GROWTH AND DEPOSITION; LOSING WATER DUE TO MULTIPLE CHANNEL BLOCKAGES

90+06

LOSING WATER DUE TO MULTIPLE CHANNEL BLOCKAGES

50+00

BLACKFOOT RIVER FLOW DIRECTION

REACH END

101+92

100+00

FROM STATION 30+00 DOWN TO THE CONFLUENCE WITH SPRING CREEK, NUMEROUS DEBRIS DAMS (WHOLE LARGE TREES, SILT AND OTHER DEBRIS) CREATE COMPLETE CHANNEL PLUGS CAUSING UPSTREAM BACKWATER AND AGGRADATION FOR HUNDREDS OF FEET AS WELL AS A WATER DROP OF 2 TO 3 FEET. THESE DAMS ARE FISH BARRIERS AND CAUSE WATER TO FLOW OUT INTO THE FLOODPLAIN AT ALL BUT THE LOWEST FLOWS, ACROSS HISTORICALLY POORLY VEGETATED SURFACES (SEE SHEET 2.2). SOME OF THE WATER RETURNS TO THE STREAM, BUT THE REMAINDER IS LOST TO DITCHES AND OTHER ADJACENT LANDFORMS.

ANOTHER UNDERSIZED BRIDGE IS LOCATED AT STATION 63+50. EFFECTS FROM THIS BRIDGE ARE SIMILAR TO THE UPSTREAM BRIDGE CONDITIONS, HOWEVER LESS PRONOUNCED DUE TO HEALTHIER RIPARIAN VEGETATION AND DIMINISHED FLOWS. WILLOW COMMUNITIES ARE PRESENT FROM 70+00 TO 84+00, BUT DUE TO DIMINISHED FLOWS, CONSTRICT CHANNEL CAPACITY DOWN TO A FRACTION OF THE UPSTREAM CROSS-SECTIONAL AREA. AGAIN, NUMEROUS DEBRIS DAMS CAUSE FLOWS TO LEAVE THE CHANNEL AT MOST DISCHARGES.

IMAGERY: 2019-07-10 RDG UAS.

0 100 200 400 600 Feet

REVISIONS			
NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

EXISTING CONDITIONS

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

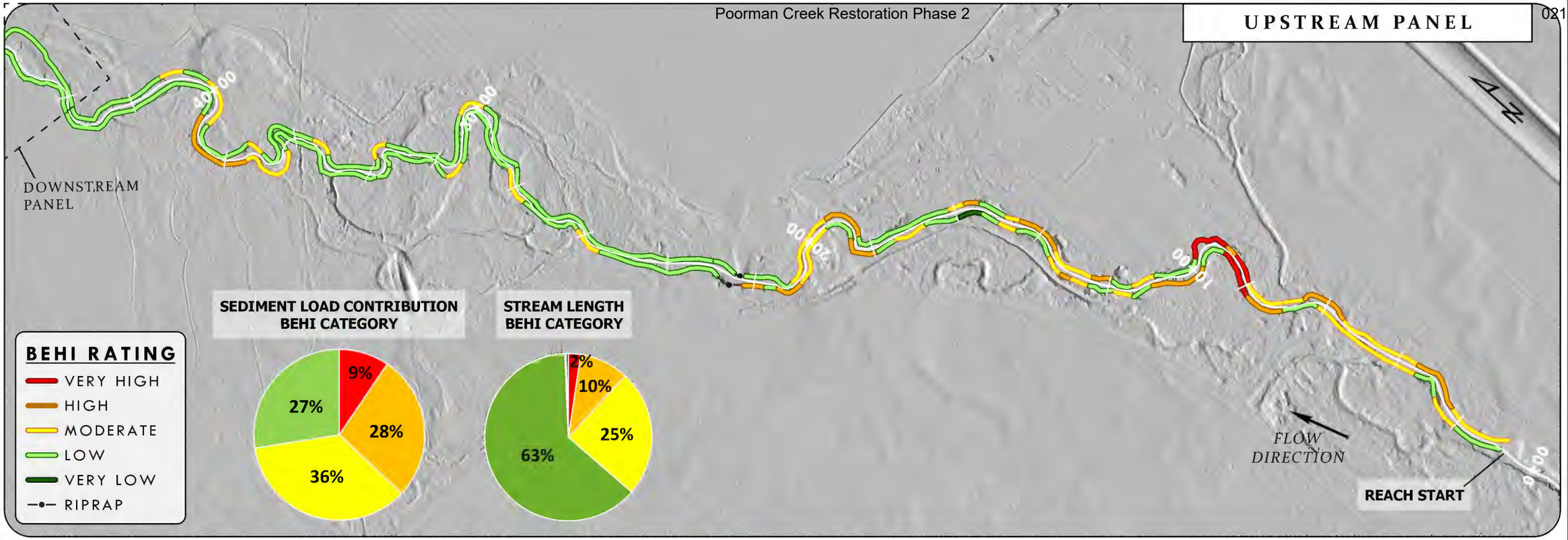
PROJECT NUMBER RDG-19-044

SHEET NUMBER 2.0

Poorman Creek Restoration Phase 2

021 2.1

UPSTREAM PANEL



DOWNSTREAM PANEL

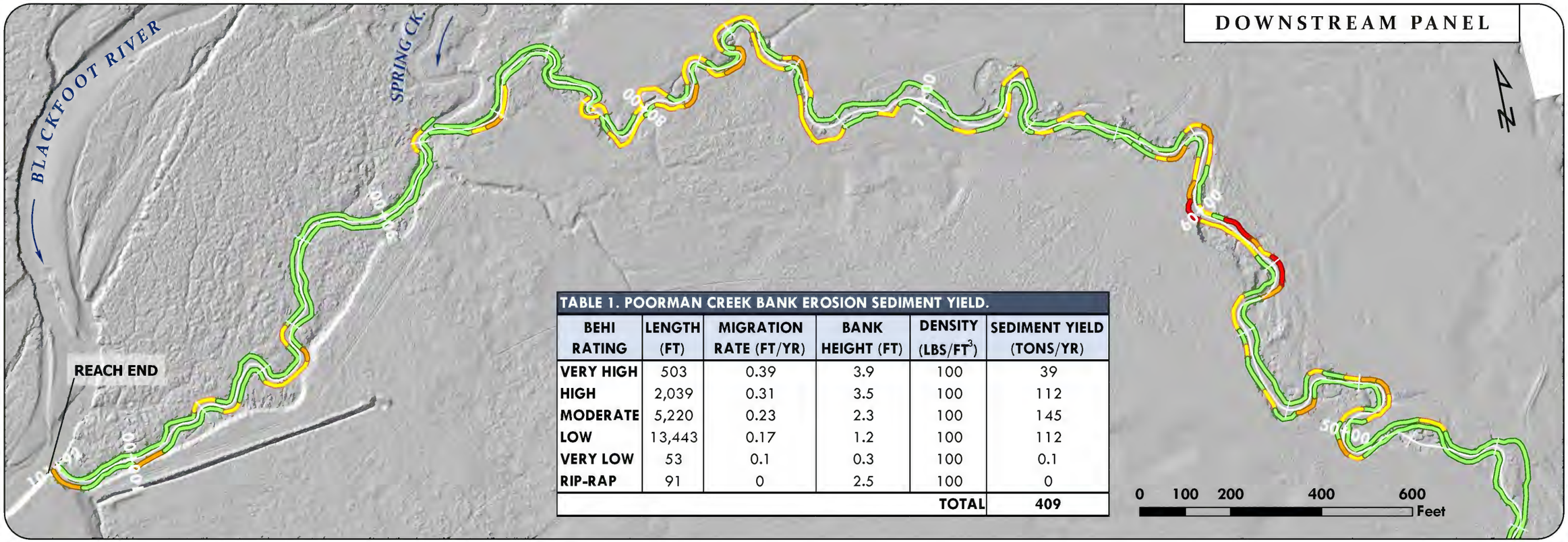


TABLE 1. POORMAN CREEK BANK EROSION SEDIMENT YIELD.

BEHI RATING	LENGTH (FT)	MIGRATION RATE (FT/YR)	BANK HEIGHT (FT)	DENSITY (LBS/FT^3)	SEDIMENT YIELD (TONS/YR)
VERY HIGH	503	0.39	3.9	100	39
HIGH	2,039	0.31	3.5	100	112
MODERATE	5,220	0.23	2.3	100	145
LOW	13,443	0.17	1.2	100	112
VERY LOW	53	0.1	0.3	100	0.1
RIP-RAP	91	0	2.5	100	0
				TOTAL	409

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

EXISTING CONDITIONS BANK EROSION HAZARD INDEX

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER 2.1

UPSTREAM PANEL

DOWNSTREAM PANEL

40+00
30+00
20+00
10+00
00+00
101+92
100+00
90+00
80+00
70+00
60+00
50+00

BLACKFOOT RIVER
SPRING CK.
FLOW DIRECTION

0 100 200 400 600 Feet

N

ELEVATION RELATIVE TO BANKFULL (FT)

-7 -2 -1.5 -1 -0.5 -0.25 0.25 0.5 1 1.5 2 2.5 3 3.5 4 6 8 10 11

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

GROUND SURFACE RELATIVE TO EXISTING BANKFULL

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

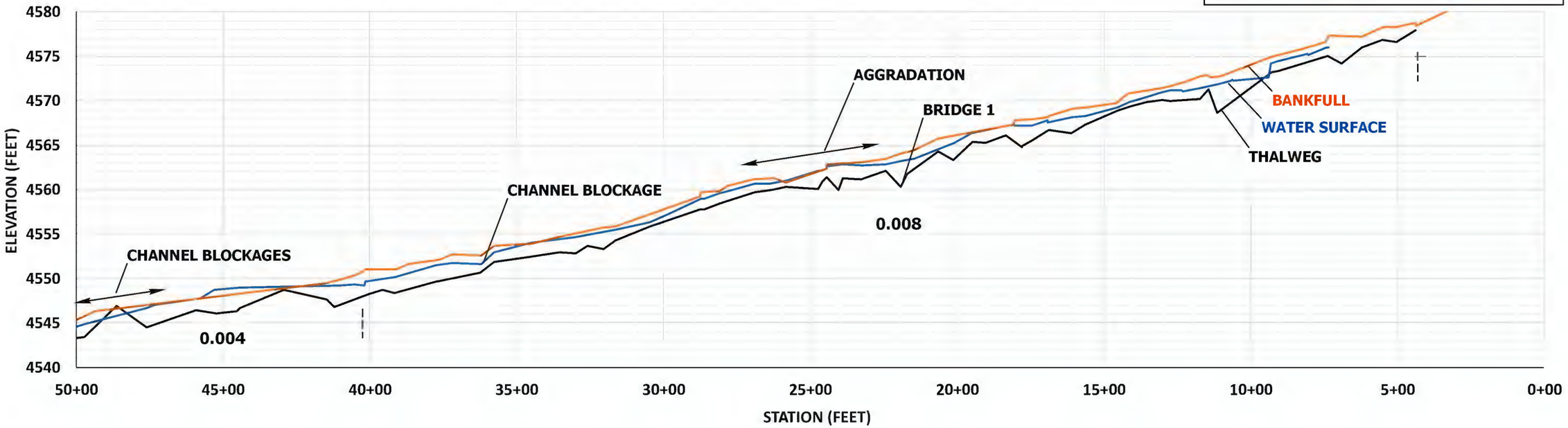
PROJECT NUMBER
RDG-19-044

SHEET NUMBER 2.2

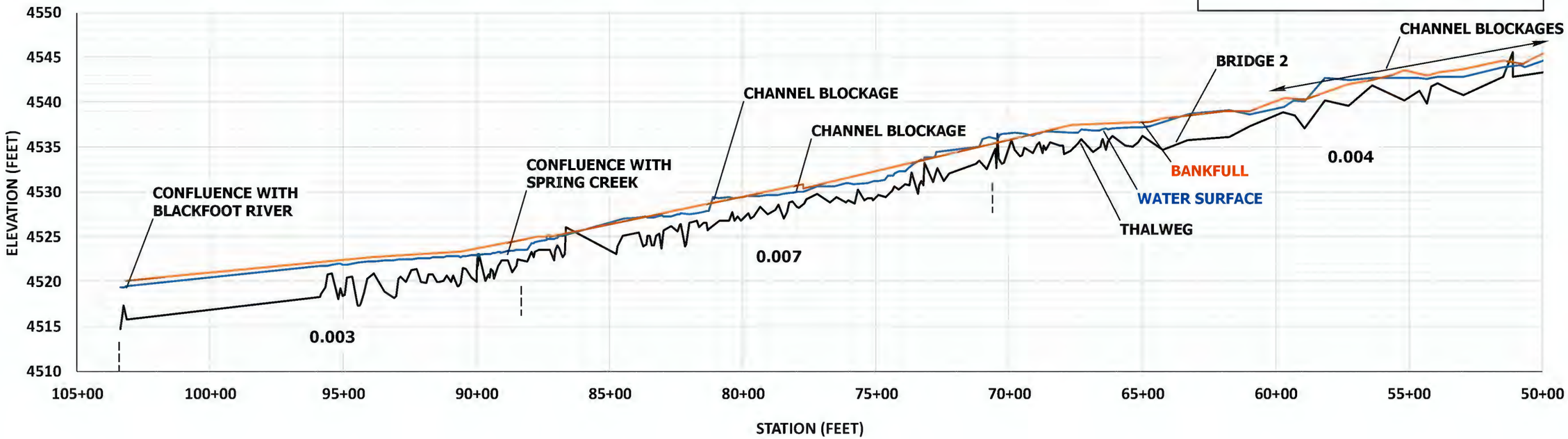
Poorman Creek Restoration Phase 2

021 29

UPSTREAM PANEL



DOWNSTREAM PANEL



REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

EXISTING PROFILE

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER
2.3

UPSTREAM PANEL

DOWNSTREAM PANEL

ENHANCE AQUATIC HABITAT, INCREASE POOL FREQUENCY

STABILIZE HEADCUT

REACH START

FLOW DIRECTION

40+00

30+00

20+00

10+00

00+00

PROPOSED FEATURES

- BANK TREATMENT: 3,870 FT
- CHANNEL RECONSTRUCTION: 997 FT
- CHANNEL SHAPING AND DEBRIS REMOVAL: 810 FT
- RAISE EXISTING BRIDGE 2 FEET: 2
- LOG DAM REMOVAL: 12
- WETLAND ENHANCEMENT: 1.2 ACRES

0 100 200 400 600 Feet

DOWNSTREAM PANEL

CONFLUENCE WITH SPRING CREEK

BLACKFOOT RIVER FLOW DIRECTION

REACH END

90+06

80+00

70+00

60+00

50+00

10+92

00+00

IMAGERY: 2019-07-10 RDG UAS.

RESTORATION OBJECTIVES

- IMPROVE INSTREAM AQUATIC HABITAT CONDITIONS FOR SALMONIDS BY INCREASING POOL FREQUENCY AND COMPLEXITY IN THE UPPER REACHES;
- RESTORE CHANNEL CAPACITY AND PROFILE IN THE MID TO LOWER REACHES BY REMOVING OR MODIFYING DEBRIS DAMS AND RESHAPING SOME SECTIONS OF THE CHANNEL;
- REDUCE BANK EROSION THROUGHOUT THE AREA USING VEGETATION AND WOOD WHILE IMPROVING RIPARIAN VEGETATION CONDITIONS; AND
- INCREASE OFF-CHANNEL WETLAND HABITAT.

RESTORATION TREATMENTS

- INSTALL WOOD AND NATIVE ROCK STRUCTURES ON THE UPSTREAM REACH TO CREATE A STEP-POOL MORPHOLOGY, INCREASING POOL FREQUENCY AND DIVERSITY WHILE TREATING THE EXISTING HEADCUTS;
- INCORPORATE VEGETATED WOOD MATRIX STRUCTURES AND LARGE WOODY DEBRIS STRUCTURES TO STABILIZE STREAMBANKS AND ESTABLISH WILLOWS THROUGHOUT THE PROJECT AREA;
- SHAPE THE CHANNEL WHERE NECESSARY TO RE-ESTABLISH CHANNEL CAPACITY, INCLUDING REMOVING LARGE DEBRIS DAMS IN REACHES WITH CHANNEL AGGRADATION; AND
- ENHANCE WETLAND HABITAT ADJACENT TO THE CHANNEL AND CONNECTED FLOODPLAINS. PASSIVE WETLAND RESTORATION THAT WILL OCCUR WITH INCREASED CHANNEL/FLOODPLAIN CONNECTIVITY WILL BE SUPPLEMENTED WITH HERBACEOUS WETLAND PLUG PLANTING AND/OR SHRUB PLANTING AND BROWSE EXCLUSION FENCING WHERE APPROPRIATE.

REVISIONS			
NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA/GD
2	10.29.19	REVISION	SA/JM
3	11.22.19	REVISION	SA/GD

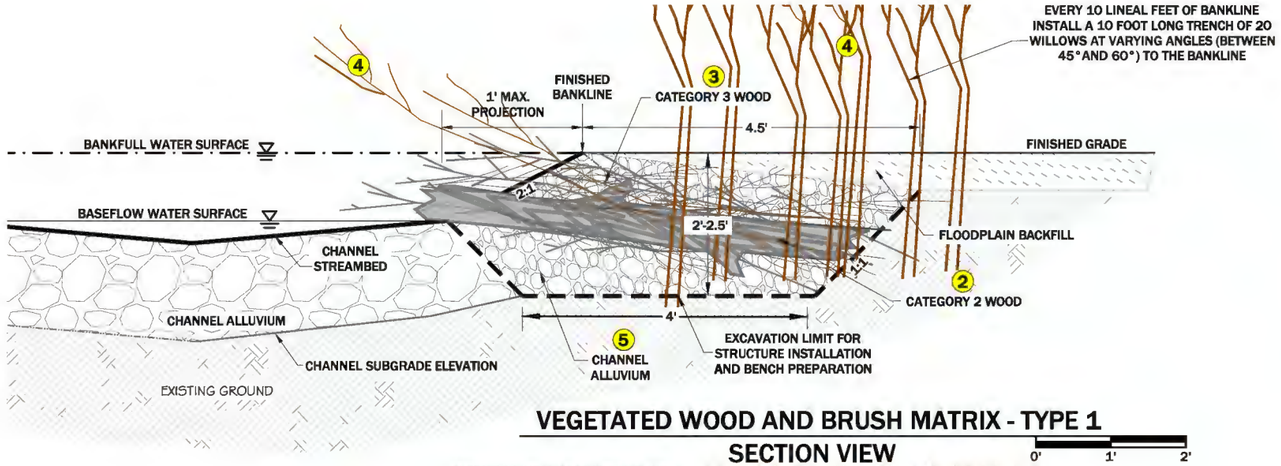
RESTORATION PLAN

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

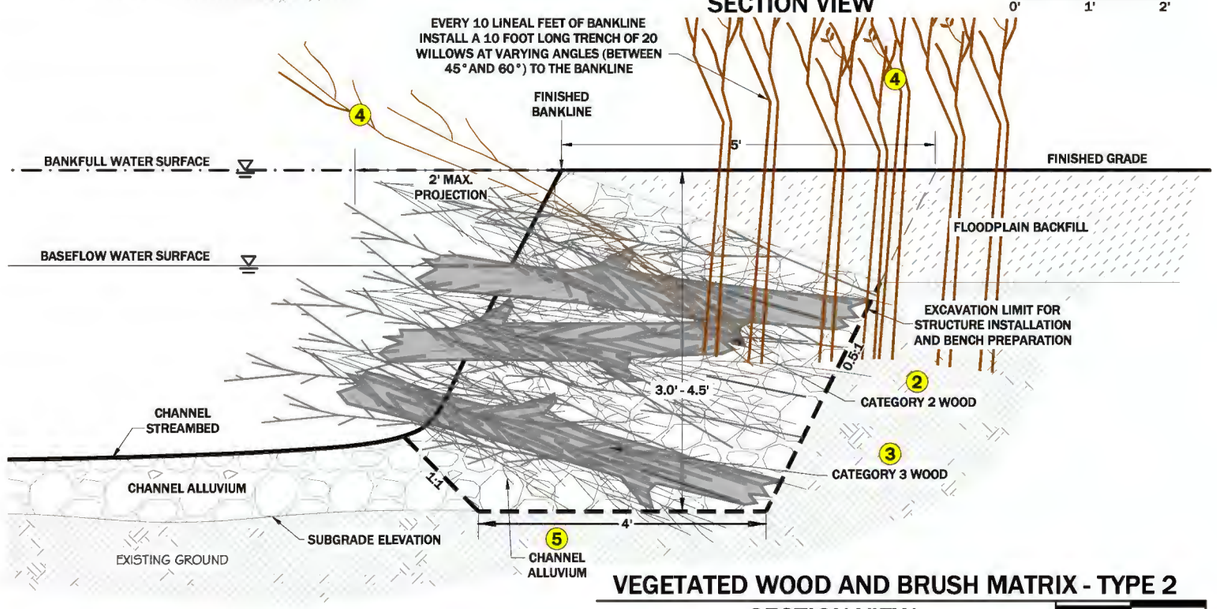
PROJECT NUMBER
RDG-19-044

SHEET NUMBER
3.0



VEGETATED WOOD AND BRUSH MATRIX - TYPE 1
SECTION VIEW

0' 1' 2'



VEGETATED WOOD AND BRUSH MATRIX - TYPE 2
SECTION VIEW

0' 1' 2'

EXAMPLE OF A CONSTRUCTED VEGETATED WOOD AND BRUSH MATRIX TYPE 1

EXAMPLE OF A CONSTRUCTED VEGETATED WOOD AND BRUSH MATRIX TYPE 2

GENERAL NOTES

1. CONSTRUCTION OF THE VEGETATED WOOD AND BRUSH MATRIX WILL OCCUR AFTER THE CHANNEL STREAMBED IS CONSTRUCTED WHERE APPLICABLE.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY ENGINEER.
4. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE GENERAL CONSTRUCTION LOCATION FOR EACH VEGETATED WOOD AND BRUSH MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

NOTES ON VEGETATED WOOD AND BRUSH MATRIX INSTALLATION

1. EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. PREPARE THE BENCH OF THE STRUCTURE BY PLACING CHANNEL ALLUVIUM FROM THE BASE OF THE EXCAVATION DEPTH/BOTTOM OF EXCAVATION TO WITHIN 1.0-FT. OF FINISHED GRADE.
3. CATEGORY 2 AND CATEGORY 3 WOOD, CHANNEL ALLUVIUM, AND SIX (6) TO EIGHT (8) FT. DORMANT WILLOW CUTTINGS AT A DENSITY OF 8 PER LINEAR FT. SHALL BE PLACED IN ALTERNATING LAYERS AND BUCKET COMPACTED AS IT IS CONSTRUCTED. WILLOW CUTTINGS SHALL SLOPE AT AN APPROXIMATE 2:1 SLOPE AS SHOWN IN SECTION VIEW. STEMS MAY OVERLAP. THE CUT ENDS SHALL BE PLACED AT THE BASE OF THE SLOPES WITH THE UN-CUT ENDS EXTENDING BEYOND THE EDGE OF THE SOIL LIFT OR TRENCH SO THAT APPROXIMATELY ONE-THIRD OF THE TOTAL CUTTING LENGTH IS EXPOSED BEYOND THE FRONT EDGE OF THE BASE.
4. THE UPSTREAM AND DOWNSTREAM ENDS OF THE STRUCTURE SHALL TRANSITION SMOOTHLY INTO ADJACENT STREAMBANK STRUCTURES TO MINIMIZE EROSION, FLANKING, AND BANK FAILURE. STRUCTURE ENDS MAY BE STABILIZED WITH ADDITIONAL CATEGORY 2 ROCK AS APPROVED BY ENGINEER.
5. AFTER INSTALLATION OF THE VEGETATED WOOD AND BRUSH MATRIX, BACKFILL THE STRUCTURE WITH STOCKPILED MATERIAL TO FINISHED GRADE AND BUCKET COMPACT. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.
6. ONCE THE STRUCTURE BACKFILL IS TO GRADE, INSTALL 10 FOOT LONG TRENCHES OF 20 WILLOWS AT VARYING ANGLES (BETWEEN 45°AND 60°) EVERY 10 LINEAL FEET OF BANKLINE.

CHANNEL ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
10	95	D100
8	80 - 90	D84
4	45 - 55	D50
2	30 - 40	D35
1	20 - 30	D15
0.08	20	

PROVIDE MINIMUM 20% RETAINED IN 0.08" SIZE CLASS

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	TYPE 1	TYPE 2
2	CATEGORY 3 WOOD	1	2
3	CATEGORY 4 WOOD	1	2
4	RIPARIAN CUTTINGS	10	10
5	CHANNEL ALLUVIUM	0.11 CY	0.2 CY

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM
3	11.22.19	REVISION	SA/GD

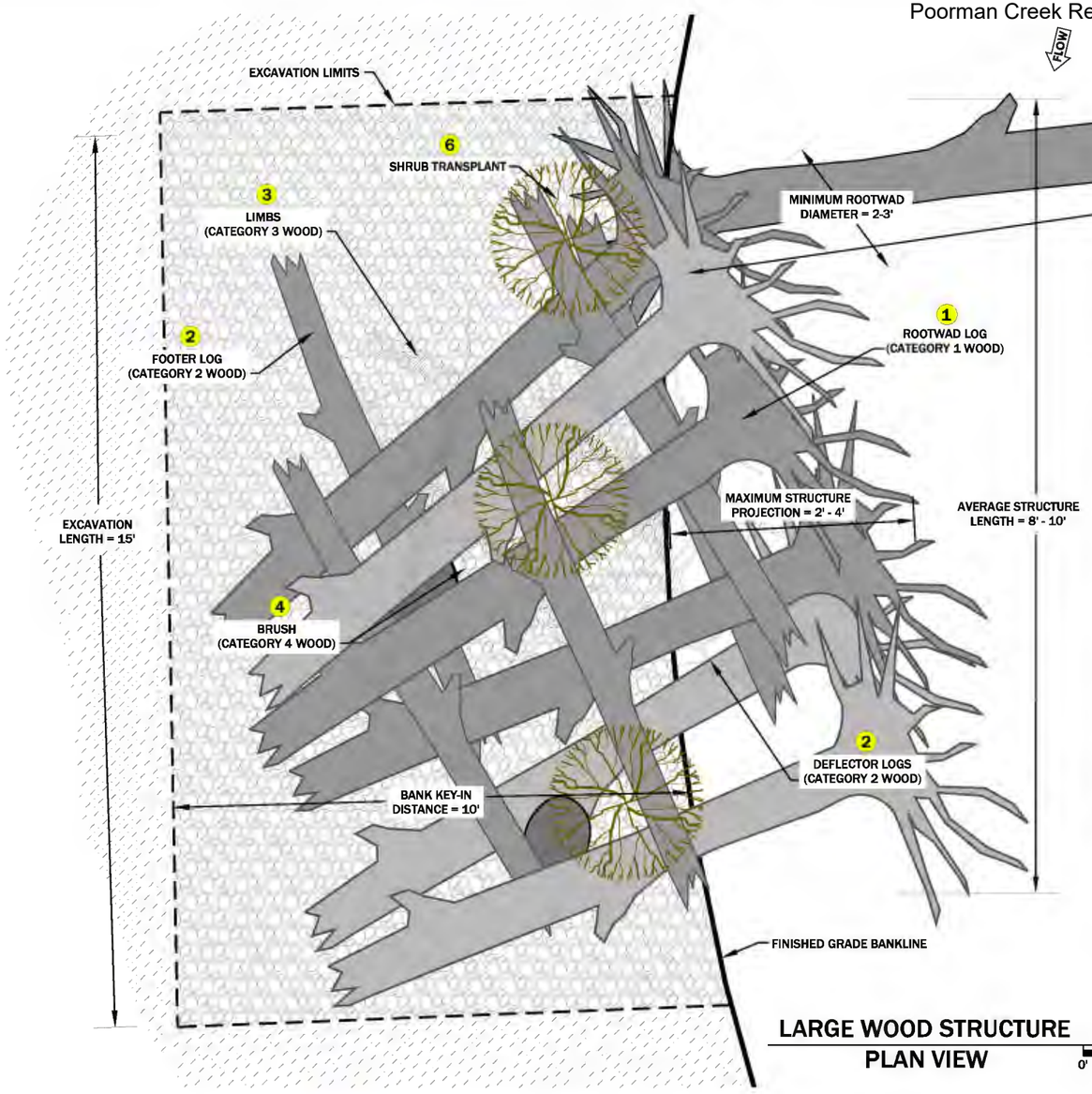
VEGETATED WOOD AND BRUSH MATRIX

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER 3.1



LARGE WOOD STRUCTURE
PLAN VIEW

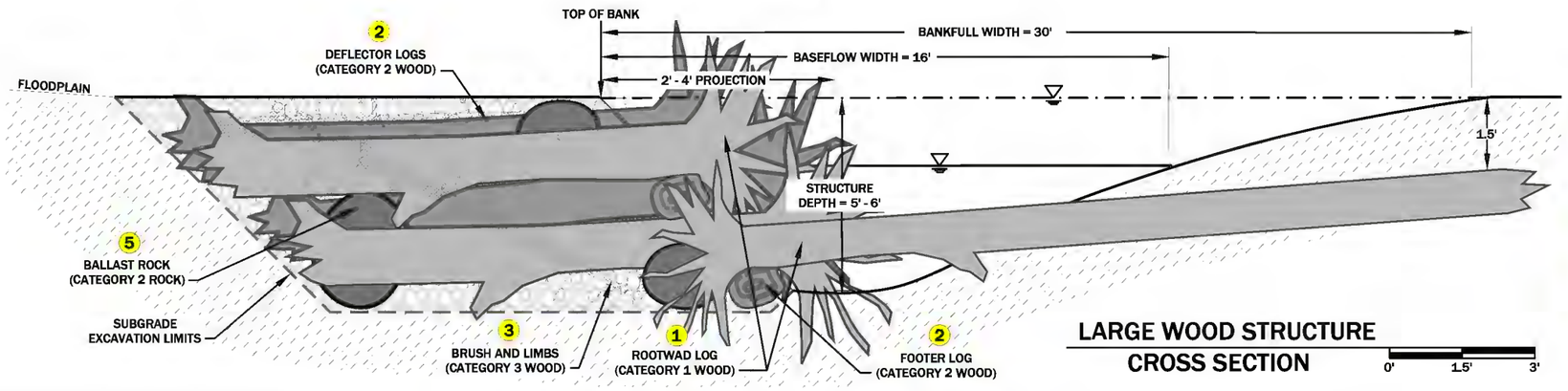
0' 1.5' 3'

GENERAL NOTES

1. CONSTRUCTION OF THE LARGE WOOD STRUCTURE WILL OCCUR AFTER THE CHANNEL SUBGRADE IS PREPARED WHERE APPLICABLE.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY ENGINEER.
4. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE GENERAL CONSTRUCTION LOCATION FOR EACH LARGE WOOD STRUCTURE PRIOR TO CONSTRUCTION

NOTES ON LARGE WOOD STRUCTURE INSTALLATION

1. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. INSTALL TWO FOOTER LOGS (CATEGORY 2 WOOD) AT THE BASE OF THE EXCAVATED TRENCH AT THE ORIENTATIONS NOTED IN PLAN VIEW. FOOTER LOGS SHALL PROJECT NO GREATER THAN 2 FT. BEYOND THE FINISH GRADE BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
3. INSTALL A CHANNEL SPANNING SILL LOG AT THE UPSTREAM END OF THE STRUCTURE. PLACE THE ROOTWAD END ON TOP OF FOOTER LOG AT 3 FEET BELOW BANKFULL AND EXTEND THE STEM ACROSS THE RUN FEATURE AND INTO THE OPPOSING BANKLINE. THE END OF THE STEM SHALL TIE INTO THE BEGINNING OF THE POINT BAR FEATURE AT 1.5 FEET BELOW BANKFULL. .
4. INSTALL TWO TO THREE ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING BOTH FOOTER LOGS AT THE ORIENTATION NOTED IN PLAN VIEW. THE UPSTREAM ROOTWAD SHALL NOT PROJECT INTO THE CHANNEL AND SHALL BE FLUSH WITH THE FINISHED BANK LINE. THE DOWNSTREAM ROOTWAD SHALL PROJECT NO GREATER THAN 2 - 4 FT. BEYOND THE FINISHED BANK LINE.
5. BACKFILL TRENCH WITH STOCKPILED MATERIAL UP TO THE TOP OF THE FOOTER LOGS. BACKFILL SHALL BE BUCKET COMPACTED.
6. INSTALL BRUSH AND LIMBS (CATEGORY 3 AND 4 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 2 - 4 FT. BEYOND THE FINISHED BANK LINE.
7. INSTALL TWO TO THREE ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING THE LOWER TIER OF ROOTWADS AT THE ORIENTATION NOTED IN PLAN VIEW. THE UPSTREAM ROOTWAD SHALL NOT PROJECT INTO THE CHANNEL AND SHALL BE FLUSH WITH THE FINISHED BANK LINE. THE DOWNSTREAM ROOTWAD SHALL PROJECT NO GREATER THAN 2 - 4 FT. BEYOND THE FINISHED BANK LINE.
8. INSTALL BRUSH AND LIMBS (CATEGORY 3 AND 4 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 2 - 4 FT. BEYOND THE FINISHED BANK LINE.
9. BACKFILL TRENCH WITH STOCKPILED MATERIAL UP TO THE TOP OF THE ROOTWAD LOGS. BACKFILL SHALL BE BUCKET COMPACTED.
10. INSTALL WHOLE SHRUB CLUMP TRANSPLANTS PER DIRECTION OF CONSTRUCTION MANAGER.
11. INSTALL DEFLECTOR LOGS (CATEGORY 2 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. DEFLECTOR LOGS SHALL PROJECT NO GREATER THAN 3 - 6 FT. BEYOND THE FINISHED BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
12. PLACE AND BUCKET COMPACT STOCKPILED MATERIAL TO THE FINISHED BANK LINE. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.
13. BUCKET WATER SHRUBS A MINIMUM OF THREE TIMES.



LARGE WOOD STRUCTURE
CROSS SECTION

0' 1.5' 3'

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	QUANTITY
1	CATEGORY 1 WOOD	5
2	CATEGORY 2 WOOD	2
3	CATEGORY 3 WOOD	8
4	CATEGORY 4 WOOD	8
6	SHRUB TRANSPLANTS	3

EXAMPLE OF A LARGE WOOD STRUCTURE

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

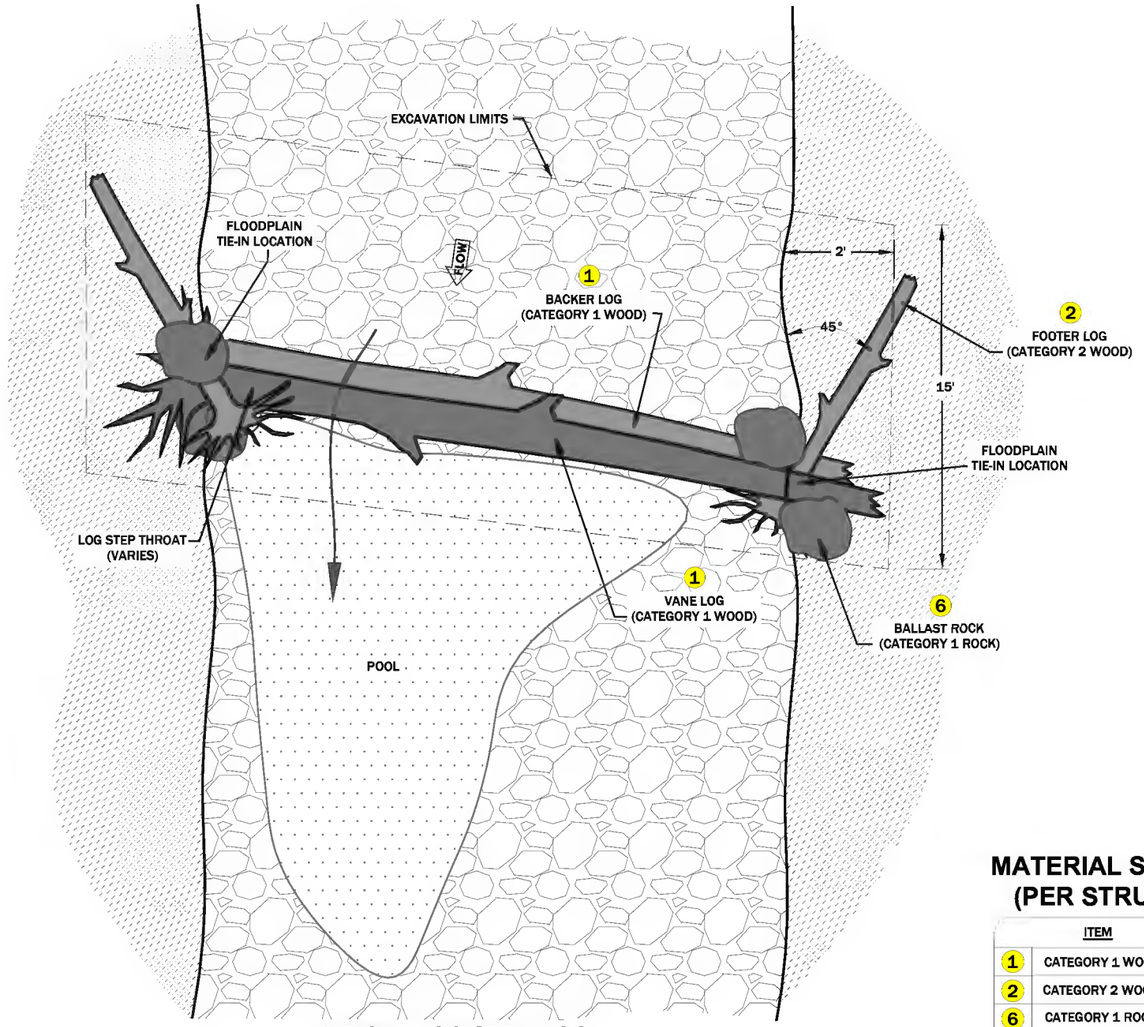
LARGE WOOD STRUCTURE

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER 3.2



TYPICAL LOG STEP POOL
PLAN VIEW
0' 3' 6'

GENERAL NOTES

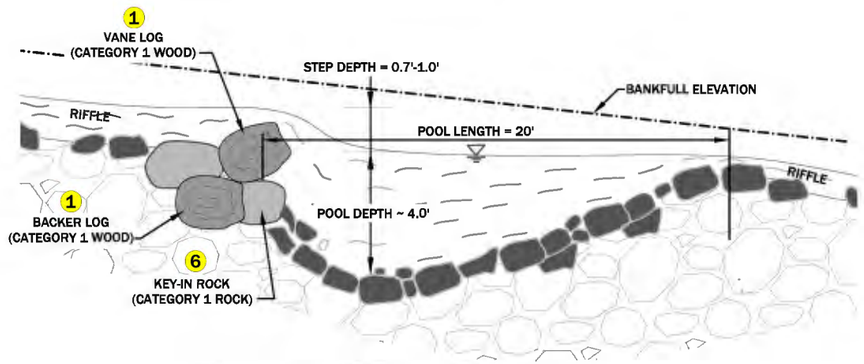
1. CONSTRUCTION OF THE CHANNEL LOG STEP POOL WILL OCCUR PRIOR TO THE CONSTRUCTED CHANNEL STREAMBED WHERE APPLICABLE.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY ENGINEER.
4. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE FLOODPLAIN AND CHANNEL STREAMBED TIE-IN LOCATIONS.

NOTES ON CONSTRUCTED CHANNEL LOG STEP POOL INSTALLATION

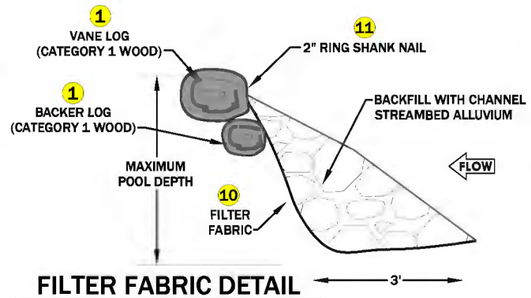
1. PRIOR TO CONSTRUCTION OF THE CHANNEL LOG STEP POOL, ENGINEER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS.
2. CONTRACTOR SHALL STOCKPILE WOOD AND ROCK PER SPECIFICATIONS NOTED ON THE DRAWINGS.
3. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
4. INSTALL FOOTER LOGS AND ORIENT STEMS AT 45° ANGLE TO THE BANKLINE. BACKFILL STEMS AT A MINIMUM OF 2.5 FT BELOW FINISHED FLOODPLAIN AND TOP OF BANK ELEVATIONS.
5. INSTALL VANE LOG (CATEGORY 1 WOOD) AT THE FLOODPLAIN TIE-IN LOCATIONS AND TO THE ORIENTATIONS NOTED ON THE DRAWING. VANE LOGS SHALL BE PLACED ON CHANNEL ALLUVIUM AND THE ROOTWAD SHALL BE EMBEDDED INTO THE STREAMBANK A MINIMUM OF 2-FT. RELATIVE TO FINISHED BANK LINE.
6. INSTALL BACKER LOG (CATEGORY 1 WOOD) ON THE UPSTREAM SIDE OF THE VANE LOG AS SHOWN ON THE DRAWINGS. BACKER LOG SHALL BE FLUSH WITH THE VANE LOG AND EXTEND FROM THE FLOODPLAIN TIE-IN LOCATIONS TO THE TIPS OF THE VANE LOG.
7. INSTALL CATEGORY 1 ROCK UPSTREAM AND DOWNSTREAM OF THE STREAMBANK TIE-IN LOCATIONS. ROCK SHALL BE IN CONTACT WITH VANE LOGS AND BACKER LOGS TO PROVIDE BALLAST AND TO PREVENT THE STRUCTURE FROM SHIFTING WHILE THE STRUCTURE IS BACKFILLED.
8. ATTACH NON-WOVEN GEOTEXTILE FABRIC TO VANE LOGS AND EXTEND VERTICALLY TO THE MAXIMUM DEPTH OF THE POOL CHANNEL CROSS-SECTION ON THE UPSTREAM SIDE OF THE STRUCTURE, AS SHOWN ON DRAWING. BACKFILL VANE LOGS WITH EXCAVATED CHANNEL STREAMBED ALLUVIUM TO CHANNEL STREAMBED FINISHED GRADE.
9. REGRADE UPSTREAM AND DOWNSTREAM CHANNEL STREAMBED FINISHED GRADE ELEVATIONS. IF EXCESS MATERIAL IS SIDECAST IN POOL DURING CONSTRUCTION, CONTRACTOR SHALL RE-EXCAVATE POOL TO THE DESIGN DIMENSIONS AS APPROVED BY ENGINEER.

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	QUANTITY
1	CATEGORY 1 WOOD	2
2	CATEGORY 2 WOOD	3
6	CATEGORY 1 ROCK	4
10	LF OF FILTER FABRIC	30
11	2" RING SHANK NAILS	20



CHANNEL LOG STEP POOL DETAIL
PROFILE VIEW
0' 3' 6'



FILTER FABRIC DETAIL
NTS

EXAMPLE OF A CONSTRUCTED LOG STEP POOL

REVISIONS			
NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM

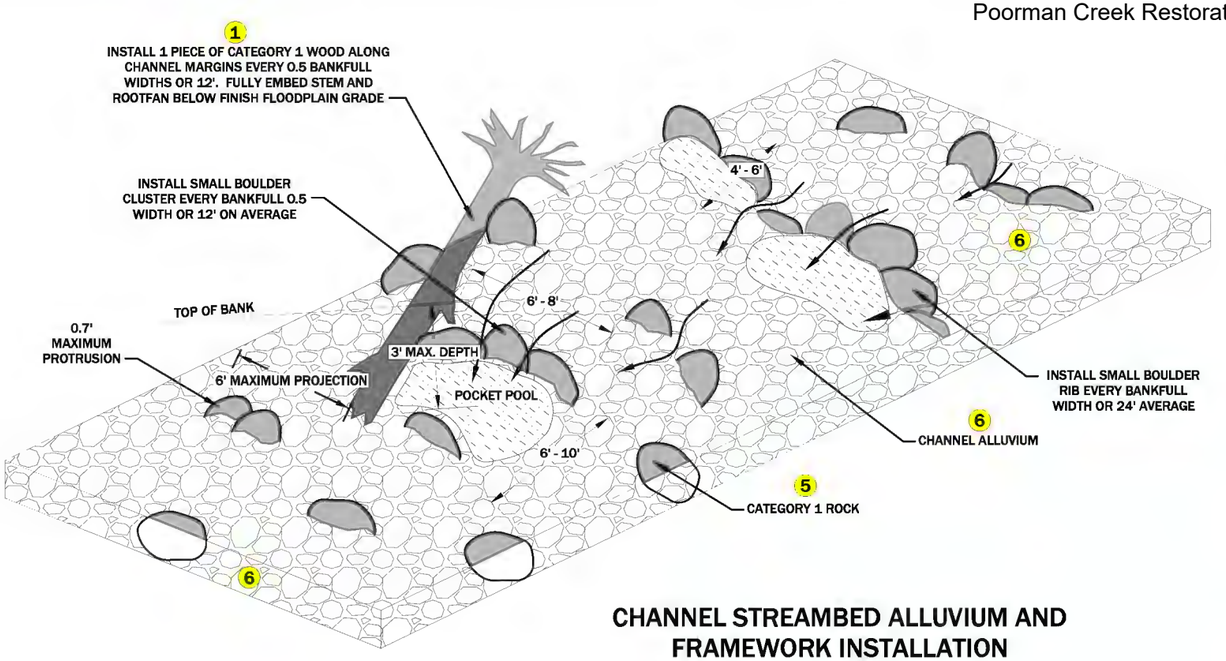
LOG STEP POOL

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

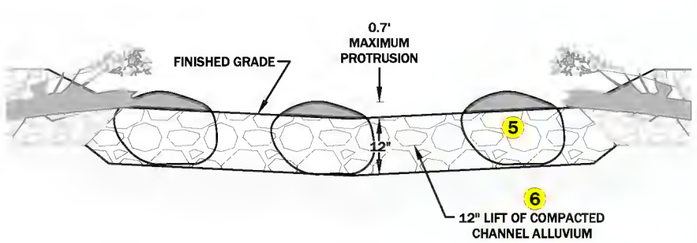
PROJECT NUMBER
RDG-19-044

SHEET NUMBER
3.3



CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION
3D VIEW

0' 3' 6'



CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION
SECTION VIEW

0' 2' 4'

GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL STREAMBED WILL OCCUR AFTER THE CHANNEL LOG STEP POOL AND LARGE WOOD STRUCTURES ARE INSTALLED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE ENGINEER.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
4. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE CONSTRUCTED CHANNEL STREAMBED STRUCTURES INCLUDING CONSTRUCTED POCKET POOLS AND RIB FEATURES.

NOTES ON CONSTRUCTED CHANNEL STREAMBED INSTALLATION

1. PRIOR TO CONSTRUCTION OF THE CHANNEL STREAMBED, ENGINEER SHALL VERIFY CHANNEL SUBGRADE WHICH WILL SERVE AS THE FOUNDATION FOR THE CONSTRUCTED CHANNEL STREAMBED.
2. CONTRACTOR SHALL STOCKPILE CHANNEL ALLUVIUM AND CATEGORY 2 ROCK PER SPECIFICATIONS NOTED ON THE DRAWINGS.
3. PREPARE THE FRAMEWORK. CONTRACTOR SHALL PLACE 18-INCH TO 24-INCH BOULDERS (CATEGORY 2 ROCK) ON THE SURFACE OF THE CHANNEL SUBGRADE AS INDICATED ON THE DRAWING. DUE TO THE INHERENT VARIABILITY IN MATERIALS, BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE WILL BE NO GREATER THAN 0.7-FT.
4. CONTRACTOR SHALL INSTALL 18-INCH TO 24-INCH BOULDERS (CATEGORY 2 ROCK) IN CLUSTERS, AS DIRECTED BY THE ENGINEER, TO CREATE A COMPLEX SERIES OF POCKET POOLS THAT EFFECTIVELY DISSIPATE ENERGY AND PROVIDE PATHWAYS FOR FISH MOVEMENT. BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE IS NO GREATER THAN 0.7-FT.
5. SMALL BOULDER RIBS SHALL BE INSTALLED AS A COMPONENT OF THE CONSTRUCTED CHANNEL STREAMBED. AS SHOWN ON THE DRAWINGS, CONTRACTOR SHALL PLACE 18-INCH TO 24-INCH BOULDERS (CATEGORY 1 ROCK) IN AN IRREGULAR PATTERN SPANNING THE FULL WIDTH OF THE BANKFULL CHANNEL, AS DIRECTED BY THE ENGINEER. THE ROCKS SHALL INTERLOCK WITH NO GAPS BETWEEN ROCKS GREATER THAN 0.5-FT. ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE IS NO GREATER THAN 0.7-FT.
6. CONTRACTOR SHALL INSTALL CHANNEL MARGIN WOOD (CATEGORY 1 WOOD) TO PROVIDE CHANNEL MARGIN AQUATIC HABITAT COMPLEXITY AND ROUGHNESS. WOOD SHALL PROJECT NO GREATER THAN 6 FEET. INTO THE CONSTRUCTED STREAMBED IN VARIOUS ORIENTATIONS TO FLOW, AS DIRECTED BY ENGINEER. WOOD SHALL BE INSTALLED EMBEDDED INTO THE CHANNEL STREAMBED A MINIMUM OF ONE-HALF THE LOG DIAMETER, AS SHOWN ON THE DRAWINGS.
7. PREPARE THE MATRIX. AFTER THE FRAMEWORK, BOULDER CLUSTERS, AND SMALL BOUNLDER RIBS ARE INSTALLED AND INSPECTED BY ENGINEER, PLACE APPROPRIATE CHANNEL ALLUVIUM GRADATION AND WASH FINES INTO STREAMBED. CHANNEL ALLUVIUM SHALL BE PLACED TO THE FULL COURSE THICKNESS IN LIFTS OF 9-INCHES TO FINISHED GRADE. INDIVIDUAL COURSES SHALL BE BUCKET COMPACTED.

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	QUANTITY
1	CATEGORY 1 WOOD	0.08
5	CATEGORY 1 ROCK	0.4
6	CHANNEL ALLUVIUM	0.7

CHANNEL ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
10	95	D100
8	80 - 90	D84
4	45 - 55	D50
2	30 - 40	D35
1	20 - 30	D15
0.08	20	

PROVIDE MINIMUM 20% RETAINED IN 0.08" SIZE CLASS

TYPICAL CONSTRUCTED CHANNEL STREAMBED

TYPICAL POCKET POOL (CROW CREEK PHASE 1)

EXAMPLE OF A SIMILAR NATURAL STREAMBED (YOCHUM ET AL. 2014)

REVISIONS			
NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA/GD
2	10.29.19	REVISION	SA/JM

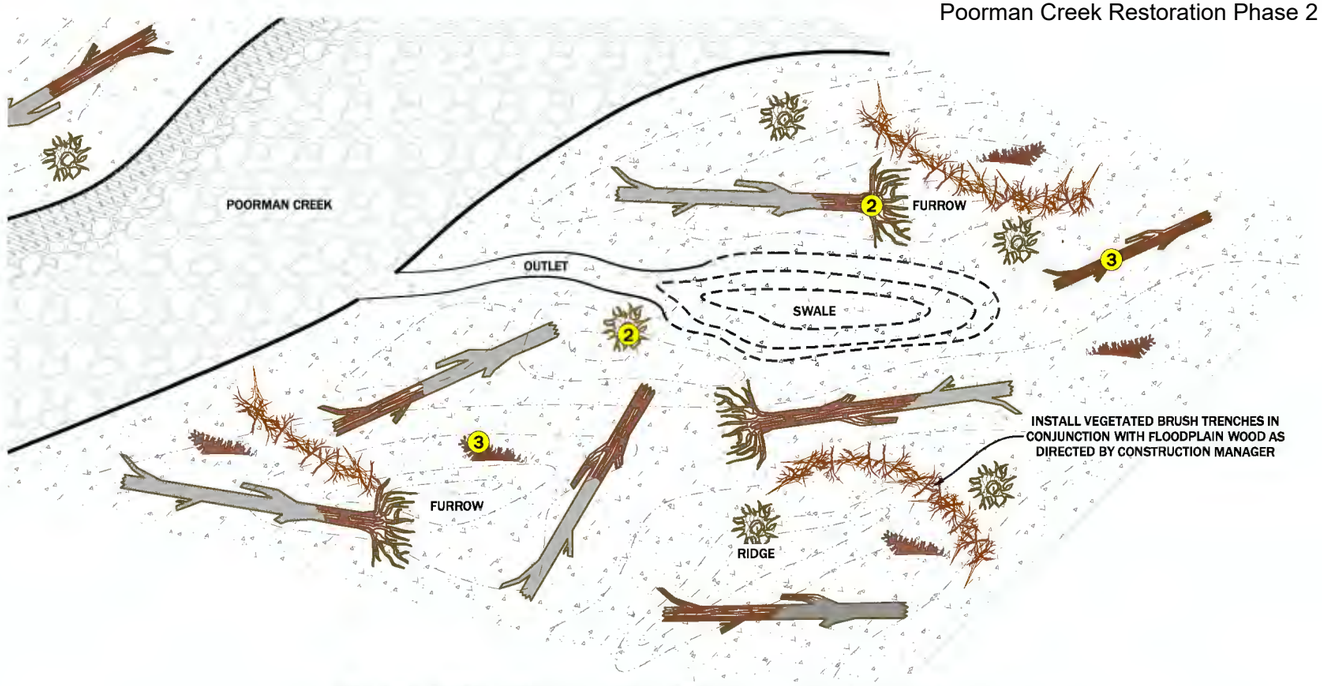
CONSTRUCTED STREAMBED

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER RDG-19-044

SHEET NUMBER 3.4



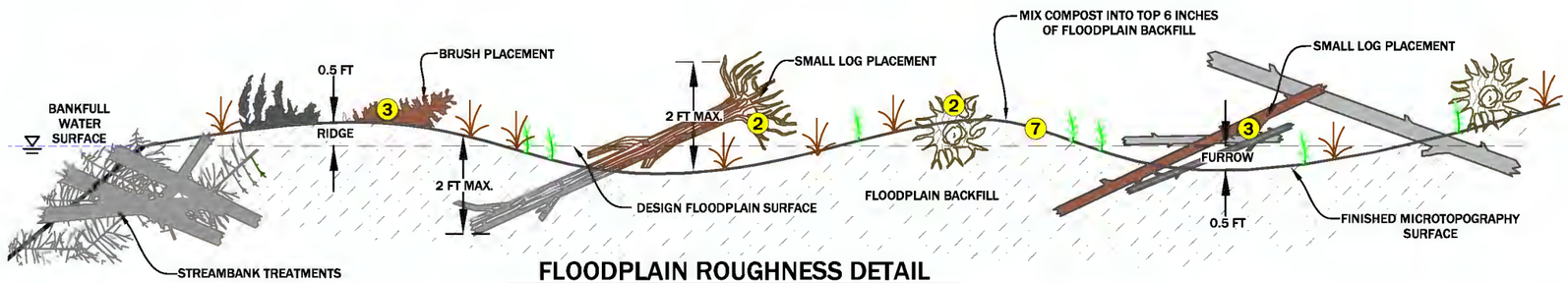
MICROTOPOGRAPHY AND FLOODPLAIN WOOD PLACEMENT
3D VIEW NTS

GENERAL NOTES

1. CONSTRUCTION OF FLOODPLAIN ROUGHNESS WILL OCCUR AFTER CONSTRUCTION OF THE VEGETATED WOOD AND BRUSH MATRIX. ALL STRUCTURE SHALL BE COMPLETED PRIOR TO FLOODPLAIN ROUGHNESS INSTALLATION AS ACCESS WILL BE LIMITED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY ENGINEER.

NOTES ON FLOODPLAIN ROUGHNESS INSTALLATION

1. CONTRACTOR SHALL DEVELOP MICROTOPOGRAPHY AND PLACE WOODY MATERIAL IN THE CONSTRUCTED FLOODPLAIN.
2. TRANSPORT CATEGORY 2, AND CATEGORY 3 WOOD FROM FROM DESIGNATED STOCKPILE AREAS. PLACE WOOD WITHIN THE FLOODPLAIN ROUGHNESS TREATMENT AREA AS SHOWN ON THE DRAWINGS.
3. PLACE CATEGORY 2 WOOD AT A RATE OF 35 PIECES PER ACRE AND SPACED AT AN AVERAGE DISTANCE OF 20 FEET FROM OTHER CATEGORY 2 WOOD. PLACE CATEGORY 3 WOOD SO IT COVERS 25 PERCENT OF THE FLOODPLAIN SURFACE (APPROXIMATELY 250 PIECES PER ACRE).
4. BURY CATEGORY 2 WOOD WITHIN THE FLOODPLAIN SURFACE, WITH ONE HALF OF THE LENGTH BURIED TO A DEPTH OF 2-FT., AND ONE HALF EXPOSED A MAXIMUM OF 2-FT ABOVE FINISHED GRADE AS SHOWN ON DRAWING. PLACE CATEGORY 3 WOOD ON THE SURFACE. CATEGORY 3 WOOD DOES NOT NEED TO BE BURIED.
5. CONSTRUCT LOW AND HIGH FEATURES (RIDGES AND FURROWS) AS SHOWN ON THE DRAWINGS. MAXIMUM HEIGHT OF RIDGES AND DEPTH OF FURROWS SHALL BE NO GREATER THAN 0.5-FT. RELATIVE TO FINISHED FLOODPLAIN SURFACE.



FLOODPLAIN ROUGHNESS DETAIL
TYPICAL CROSS SECTION NTS

MATERIAL SCHEDULE (PER ACRE)

	ITEM	QUANTITY	UNIT
2	CATEGORY 2 WOOD	35	EA
3	CATEGORY 3 WOOD	25	% COVER*

*APPROXIMATELY 250 PIECES/ACRE

EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS

EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS

EXAMPLE OF CONSTRUCTED FLOODPLAIN SWALE

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA/GD
2	10.29.19	REVISION	SA/JM
3	11.22.19	REVISION	SA/GD

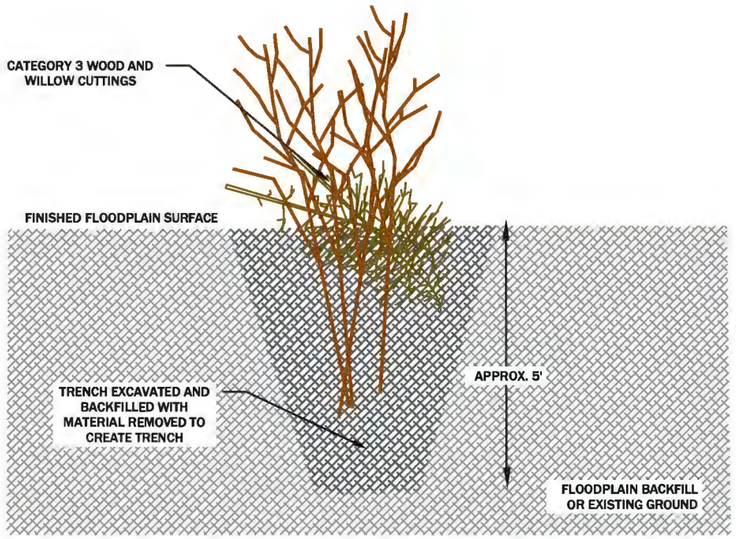
FLOODPLAIN ROUGHNESS

POORMAN CREEK RESTORATION

RDG RIVER DESIGN GROUP
236 WISCONSIN AVE | WHITEFISH, MT 59937 | 406.862.4927
311 SW JEFFERSON AVE | CORVALLIS, OR 97333 | 541.758.8524

PROJECT NUMBER
RDG-19-044

SHEET NUMBER
3.5



VEGETATED BRUSH TRENCH
PROFILE VIEW NTS

GENERAL NOTES

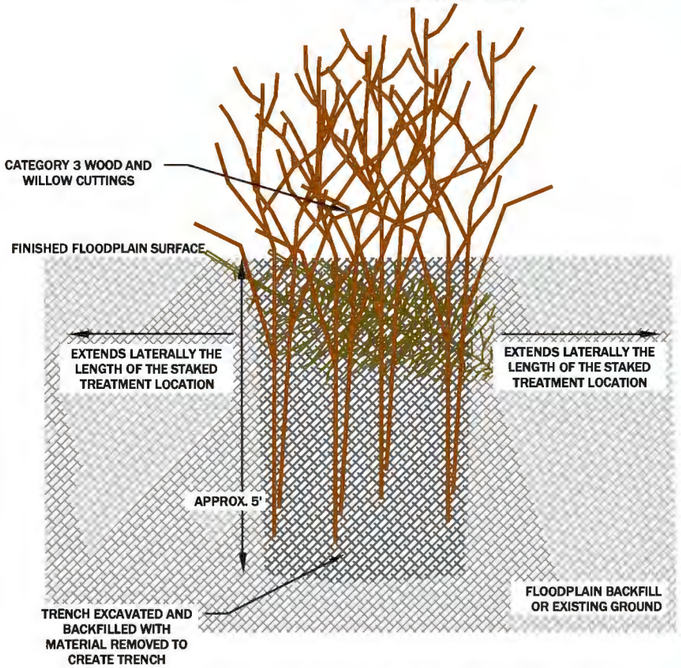
1. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED TO INCREASE FLOODPLAIN CONNECTIVITY, DISPERSE SURFACE FLOWS AND PROMOTE REVEGETATION. CONSTRUCTION OF VEGETATED BRUSH TRENCHES WILL OCCUR AFTER THE VEGETATED WOOD AND BRUSH MATRIX. CONSTRUCTION WILL OCCUR AFTER SEPTEMBER 15TH AND BEFORE THE END OF THE CONSTRUCTION SEASON.
2. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE GENERAL CONSTRUCTION LOCATION FOR EACH VEGETATED BRUSH TRENCH PRIOR TO CONSTRUCTION.

NOTES ON VEGETATED BRUSH TRENCH INSTALLATION

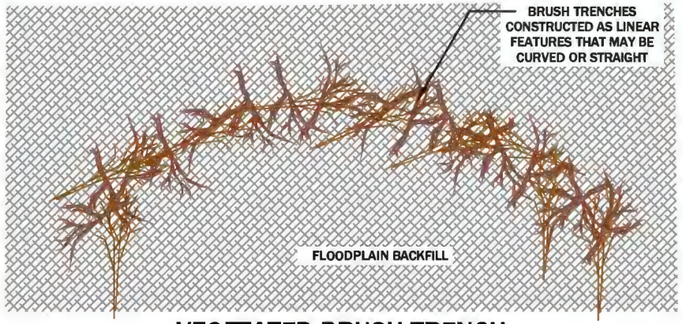
1. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED WITHIN THE FLOODPLAIN AS DIRECTED BY THE CONSTRUCTION MANAGER.
2. A TRENCH WILL BE CONSTRUCTED APPROXIMATELY 5' DEEP AND EXTEND THE LENGTH OF THE STAKED TREATMENT LOCATION. LIVE WILLOW CUTTINGS AND CATEGORY 3 WOOD WILL BE PLACED IN THE TRENCH SUCH THAT THEY ARE INTERMIXED AND ORIENTED AT A NEAR VERTICAL ANGLE.
3. THE TRENCH WILL THEN BE BACKFILLED WITH THE SAME MATERIAL REMOVED TO CREATE THE TRENCH AND SHOULD MATCH THE ELEVATION OF THE SURROUNDING FLOODPLAIN GRADE.

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	QUANTITY
3	CATEGORY 3 WOOD	3
6	WILLOW CUTTINGS	5



VEGETATED BRUSH TRENCH
SECTION VIEW NTS



VEGETATED BRUSH TRENCH
PLAN VIEW NTS

EXAMPLE OF A VEGETATED BRUSH TRENCH INSTALLATION

EXAMPLE OF A CONSTRUCTED VEGETATED BRUSH TRENCH

REVISIONS

NO.	DATE	DESCRIPTION	BY/CHK
1	10.18.19	CONCEPT DESIGN	SA\GD
2	10.29.19	REVISION	SA/JM
3	11.22.19	REVISION	SA/GD

VEGETATED BRUSH TRENCH

POORMAN CREEK RESTORATION

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PROJECT NUMBER
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